INTERAGENCY
BURNED AREA EMERGENCY STABILIZATION AND REHABILITION PLAN

APPENDIX VI - MONITORING ESR IMPLEMENTATION OSTER LAKE FIRE HAGERMAN NATIONAL FISH HATCHERY

First and Second Year Monitoring ESR Implementation
Oster Lake Fire

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The Oster Lake Fire burned much of the land within the Hagerman National Fish Hatchery (Hatchery) and the Hagerman Wildlife Management Area (WMA) which includes Service land managed under a Memorandum of Understanding with the Idaho Department of Fish and Game (IDFG). The catastrophic wildfire burned most of the shrub/steppe vegetative community setting back succession to an early stage. Grazing and farming practices, prior to land purchase by the Fish and Wildlife Service, had reduced and weakened pre-burn native grasses and forbs leaving the way open for invasion by weeds and non-native cheatgrass. By September, 2001, cheatgrass had reached all parts of the Hatchery. The Oster Lake fire removed native vegetation and would have allowed even more cheatgrass to invade the site. To prevent this site degradation, seeding was done to create stable, native grasslands that could slow down or halt cheatgrass invasion. This seeding was done during November 2002, following earlier spraying with the herbicide *Round-up*, using a rangeland drill where possible and hand seeding and raking in rocky or inaccessible areas. Straw mulch was blown onto the seedbed to preserve moisture and crimped into the ground to prevent blowing. Also, willow cuttings were harvested from nearby State fish hatchery lands and planted along Riley Creek during April 2002, to stabilize stream-banks and to prevent cutting and deposition.

Monitoring

The purpose of monitoring during August, 2003 and July, 2004 was to measure effectiveness of the seeding and planting to allow management to make decisions about future action. Items to be measured and estimated were taken from the Oster Lake Fire Burned Area Emergency Stabilization & Rehabilitation Plan dated September 21, 2001. Items measured were; species composition, number of plants per square foot and per acre, average root depth per acre, average root mass per acre, average plant height per acre and average root penetration per acre. Items to be estimated are; vigor, root cover per acre, erosion per acre, ground cover for the rest of the area and willow survival.

Methodology

Monitoring was accomplished by August 31, 2003 and by July 29, 2004. It consisted of nine 10-plot transects with each plot 10 paces (ten yards) apart. A total of 90 plots gave acceptable statistical coverage for the 196 acres in the seeding. The .96 square foot circular plot was used due for ease in calculating per-acre values. Transects were placed in both drill seeded and hand seeded areas where there was enough room for transects. Paired 100-pace transects with 20 plots total were run in three different places; the northeastern field, near the gate entrance to the hatchery and behind the residences. The remaining four transects were run separately in areas that were too small for 20 plots. A new 10 plot transect was run in 2004 following re-seeding during 2003 on the first bench above Len Lewis Spring and the Brailsford Ditch. The first seeding had failed in this location. The rest of the area was monitored using ocular estimates once the plot results were calculated. Estimates of willow survival rates were made based on a count of dead cuttings as opposed to the total number of cuttings planted.

Findings

The following results are an average of nine, 10-plot transects (90 plots) using a .96 foot hoop. Data were collected from all of the 196 seeded acres.

Table 1. Monitoring Results for 2003 and 2004.

Measure	2003	2004
Average Plants per Square Foot	2.8	2.9
Average Plants per Acre	121,968.0	126,324.0
Average Distance Between Plants (inches)	13.1	10.8
Average Ground Cover (percent)	30.1	53.0
Plant Vigor (estimated on a scale of 1-10)	5.2	5.2
Average Plant Height (inches)	3.8	6.5
Average Root Depth (inches)	2.5	4.2
Average Root Mass (inches)	4.5	6.3
Estimated Erosion per Acre (percent)	11.0	10.0
Estimated Plants per Square Foot	3.8	3.9
Estimated seeded Plants Per Square Foot in Old Field	0.2	0.3
Estimated Seeded Plants per Square Foot 1st Bench	0.3	4.7
Willow Survival (percent)	87.0	86.0

Table 2. Species Composition

Seeded Plants	2003 percent	2004 percent
Snake River Wheatgrass	20.0	23.0
Thickspike Wheatgrass	30.0	12.0
Indian Ricegrass	25.0	50.0
Great Basin Wildrye	0.07	0.5
Sand Dropseed	18.0	20.0
Sage Brush	0	0
Total	100.0	100.0

Table 3. Species Composition for Seeded and Other Plants

Plants	2003 percent	2004 percent
Seeded Plants	73.0	20.0
Other Plants	27.0	80.0
Total	100.0	100.0

The drill seeding and the hand seeding worked well, as can be seen from a review of the data. An average 2.88 seedlings per square foot (2004) with acceptable vigor is a good result for a wild-land seeding (including old fields) in the 8-9 inch precipitation zone. According to Warren Ririe, Range Conservationist, USDA, Forest Service and Plant Mike Pellant, Ecologist, USDI, Bureau of Land Management, anything over 1.0 seedling per square foot is a good to excellent outcome for seeding in the Hatchery elevation and precipitation zone. Further, anything more than .75 seeded plants per square foot was an excellence outcome in the 11 to 13 inch precipitation zone in the Intermountain Region (Valentine 1971). This is, of course, in a wetter zone than the Hatchery which has a precipitation rate of 8 to 9 inches. Recent work by Jim Young of the USDA Agricultural Research Service in Wyoming validates that seeding success rates of over 1.0 seedling per square foot is an excellent outcome. Lee Brooks, Plant Materials

Specialist, USDA, Natural Resources Conservation Service, verified that 2.9 seedlings per square foot is a very good outcome for the Oster Lakes seeding. The average distance of 10.8 inches between plants (in 2004) shows that an adequate stand of grass will result considering that mature grass plants are easily 10 inches in crown diameter. Plant height and root depth measurement also show that plant vigor is good on average. Plant vigor in some areas (along Transect #4 near the schoolteacher house, between Oster Lake and the river and along the Magic Springs Road near the private land gate) is down in 2004 due to extreme competition from cheat grass and Russian thistle.

The straw mulch helped conserve moisture which aided in seedling establishment. This was especially true for hand-seeded areas like the archaeological site. Seedlings were evident in the areas still covered by at least ½ inch of straw. Wheat straw worked better for the intended purpose than barley straw. Barley straw tended to shatter during crimping, was lighter and blew away to a larger degree than wheat straw. Seedling survival was at least 15.0 percent higher where wheat straw was used for mulch. Much of the reason for the high average ground cover rate of 30.0 percent for 2003 and 53.0 percent for 2004 was that the straw mulch was still on the ground approximately three years after it was applied. The crimping operation clearly kept the straw from blowing away. Erosion rates for other seeded areas on sandy loam soils are generally higher than the estimated 10.0 percent for the Oster Lake seeding (personnal communication, Mike Pellant, BLM). This low rate is directly related to the ground cover provided by the remaining straw along with seeded grass cover.

Of the seeded species three years after application, Snake River wheatgrass (*Pseudoroegneria lanceolatus var. Secar*), Indian ricegrass (*Achmenoides hymenoides var. Nezpar*) and sand dropseed (*Sporobolus cryptandrus*) did the best, accounting for a combined composition of 93.0 percent. Great Basin wildrye (*Leymus cinereus var. Trailhead*) did not come up as well and has accounted for only 7.0 percent of the total. Excavation of drill furrows during monitoring in August 2003 showed that there was un-germinated seed in the ground. This led to the conclusion that more grass could come up during the second and third years following the seeding which is common during dry years. Twenty five percent more Indian ricegrass did come up as shown by the July 2004 monitoring. There was no sign of the seeded sagebrush. Seeded grasses accounted for 73.0 percent of the total number of plants per square foot in 2003 but only 20.0 percent in 2004 as more weeds came into the plant community. Weed vigor was better the first year following treatment, however, the wheatgrass and Indian ricegrass plants have overtopped the weeds in late July 2004.

The seeding was successful (at least one or two plants per square foot) on 181 out of 196 acres that was seeded, or a success rate of about 92.0 percent by August 2003 but was 84.0 percent by July 2004. Fifteen percent of the seeding (or about 30 acres) had failed by summer 2004. The main reason for seeding failure on the old field (15 acres) near the north eastern boundary of the Hatchery was a distinct plow-shear layer at five to seven inches below the soil surface. This extremely hard, five-inch thick layer limits root penetration, nutrient cycling and available water for seedlings especially in the alkaline soil. This layer was not discovered during planning or implementation and was unknown until post-seeding soil samples were taken in an effort to determine reasons for the seeding failure. Soil samples taken in adjacent areas where the seeding succeeded confirmed the lack of a hard plow layer, showing that those areas had not been cropped. The rangeland drill and mechanical crimper used during the seeding and straw crimping process did not penetrate deep enough to mitigate the hard layer. In fact, the rangeland drill was set for 1.5 inches for the wheat grasses and wildrye and 3.0 inches for the Indian ricegrass, therefore planting seeds in the loose soil above the plow shear layer. Characteristics of the old field show that it had been cropped as a bean field and abandoned before or at the time the Fish and Wildlife Service purchased the property. The field had lain fallow for at least 75 years and the plow shear layer was still intact. Bean fields were plowed very shallow in the Magic Valley which results in a shallow plow shear layer. Also, when beans are raised year after year, the soils are depleted of nutrients and organic material which causes the structure and texture to break down resulting in sub-surface compaction.

By summer 2004 areas that had less than 1.0 plant per square foot were showing significant reduction in plant vigor from weed competition. The shape and extent of these areas seem to indicate that more of the property was farmed than was earlier thought.

The hand seeding, raking and mulching on about 3 to 4 acres on the first bench above the Len Lewis Spring and Brailsford ditch failed due to high salt content, truncated soil and lack of moisture on this south-facing site. The site was much too severe for the standard seed mix. Survival in pockets where the straw provided additional moisture was noted. This area was re-drilled during October 2003 and success rates measured during monitoring in 2004 are acceptable (more than 3.0 seedlings per square foot).

Estimated willow survival rate along Riley Creek was a very good 86.0 percent three years after planting. This is attributed to harvesting the willow cuttings at the right time of year, using large cuttings and painting the tops of the cuttings with white house paint to prevent moisture loss. Painting was a tip picked up from the IDF&G employees who gave a short training session to the planting crew. Failure of some cuttings to take root was caused by crew members planting small numbers of cuttings too high on the banks, well above the water table. Virtually no cutting that was planted properly died.

There was no identifiable seedling survival from the hydromulching that was done on about five acres around the cultural site and the Brailsford ditch line in late October 2001. This failure was probably due to improper mixing of the cellulose (newspaper in this case) resulting in large chunks which separated seed from the soil surface. The seed dried out and died before taking root. This area was hand seeded again, raked (no raking was done on the cultural site) and scattered with straw which resulted in acceptable seedling survival rates (at least 2.5 plants per square foot).

Recommendations

Following discussions about the seeding failure in the old fields (20 acres), the decision was made to not try reseeding again due to the high cost of $5,000 to $7,000 and projected marginal results. Furthermore, the ripping treatment would turn up rocks and caliche (calcium carbonate) and create an unacceptable weed problem which would contribute to the projected low seedling survival rates.

A additional10 acres of seeding failure was located during monitoring but was scattered in small patches and therefore would be difficult to reseed. No more treatments are recommended for these areas.

Table 4. Areas and Reasons for seeding failure.

Location	Acres	Reason for Failure
East Field near Gate	15.0	Possible Bean Field
Bean Field	5.0	Plow Shear Layer
South Boundary near Fence	1.0	Possible Bean Field
West of School Teacher's House	6.0	Overwhelmed by Weeds
Oster Lake Site-Near Rim	1.0	Overwhelmed by Weeds
Magic Springs Road-North Facing	2.0	Overwhelmed by Weeds
Total	30.0	15% of seeding

Another area where hand seeding initially failed was part of the lower bench above the Len Lewis Spring and the Brailsford Ditch. This site was critical because erosion could put sediment into the spring water which could negatively affect hatchery operations. Emergency stabilizing was completed again during October 2003. This time more drought tolerant and salt tolerant plants were used and they were planted in the ground using a "half rangeland drill" that was towed into the area. The Bureau of Land Management, Vail, OR District Office provided the drill.

Table 5. Seed mix that was used on Lower Bench:

Species	Pounds PLS	Percent
Needle and thread grass (*Stipa comata*)	5 lbs./acre	40.0
Bottle brush squirreltail (*Leymus elymoides* var. Sand Hollow)	3 lbs./acre	15.0
Indian ricegrass (*Achmenoides hymenoides* var. Nezpar)	3 lbs./acre	15.0
Fourwing saltbush (*Atriplex canescens*)	8 lbs./acre	30.0
Total	21 lbs./acre	100.0

This seed mix was drill seeded using a "half rangeland drill" with one inch depth bands. The drilling was completed in October 2003 and by July 2004, the results were favorable. Grass coming up in drill rows can be seen over 80.0 percent of the area seeded. There are 4.7 seedlings per square foot. Average distance between plants is 6.3 inches and the ground cover is 48.0 percent, mainly from the straw which was crimped in on the site. On-site erosion from wind and water were noted over 25.0 percent of the area. Seedlings showed an estimated vigor of five on a scale of one to ten. The bottlebrush squirreltail and the needle and thread seedlings are doing very will on the harsh site. Some small fourwing saltbush seedlings were present in the transect plots.

Based on the first and second years monitoring over the entire project, the Great Basin wildrye did not respond well. Thickspike wheatgrass seedlings came up the first year but are dying back, perhaps resulting from weed competition. Un-germinated seed that was in the drill rows during summer 2003 proved to be Indian rice grass seed, some of which came up in the spring of 2004. Future seed mixes for the Hatchery area should include needle and thread grass (Stipa comata) and bottlebrush squirreltail (Leymus elmoides) instead of Great Basin wildrye. Future mixes should contain less thickspike weatgrass and more fourwing saltbush.

Table 6. Recommended seed mix for the Hatchery

Species	Pounds PLS	Percent
Needle and thread grass (*Stipa comata*)	5 lbs./acre	20.0
Bottle brush squirreltail (*Leymus elmoides* var. Sand Hollow)	3 lbs./acre	20.0
Indian ricegrass (*Achmenoides hymenoides* var. Nezpar)	3 lbs./acre	25.0
Snake River wheatgrass (*Pseudoroegneria spicata* var. Secar)	8 lbs./acre	24.0
Basin big sagebrush (*Artemisia tridentata* spp. tridentata	.1 lbs./acre	1.0
Fourwing saltbush (*Atriplex canescense*)	5 lbs./acre	10.0
Total	24.1 lbs./acre	100.0

Seed should be drilled wherever possible due to proven success rates. If seed has to be hand scattered it should be raked and straw or mulch should be scattered to a depth of 1/2 inch over the top. The above seed mix is based on all experience gained from the Oster Lakes seeding and should be used.

Straw spreading and crimping improved seedling survival rates and should be done on any drill seeding project in the Hatchery area. The crimping is needed to stop the straw from blowing

away. Wheat straw rather than barley straw should be used because it is heavier, more resilient and crimps into the soil better. It is also more resistant to blowing than barley straw. Compost is a good alternative but costs can be prohibitive if sources are a long distance away which drives up haul costs.

If future hydromulching is done, newspaper should not be used for the cellulose component. In fact, the cellulose could be left out completely with seed and appropriate tackifier sprayed on the slope. Straw can be placed over the site once the seed and tackifier has been applied to hold moisture.

Willow cutting survival rate (86.0% as of July 2004) was very high based on past experience. This high rate can be attributed to using very large cuttings (1 to 2 inches in diameter and four feet long), harvesting the cuttings just prior to budding, planting immediately following harvest, painting the cut tops with house paint to prevent drying and planting only where there is a high water table. If any one of these attributes is missing then willow planting should not be done.

References

Valentine, J.F. 1971. *Range Development and Improvements*. Brigham Young University Press, Provo, UT